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ABSTRACT

This study investigated ways in which the costs of a library's direct and indirect services can be equitably allocated to its heterogeneous group of institution users. It was conducted from October 1, 1974 to March 31, 1977. The final report is divided into four parts, each describing a separate issue. Part I discusses the general administrative concerns prompting the study, gives background information on the Houston Academy of Medicine-Texas Medical Center Library (HAM-TMC) where the study was conducted and data collected, lists the institutions which make up the library's user population, and identifies the personnel of those institutions whose needs define the kinds of collections and services required of the library. The library's direct and indirect services to its user groups are described, and matrices show the types of resources and labor required for each. A cost assessment model of the total operating costs for the HAM-TMC library was generated: total costs = out-of-pocket costs for direct services + support costs variable with usage + support costs fixed with usage but related to institutional programs and other factors. The model allows the library's administration to discuss and refine institutional assessments rapidly and accurately as priorities change or unforeseen circumstances arise. Parts II and III of the report focus on the cost assessment model and its applications. (Author/JPF)

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Research Report CCS 301

COSTS AND THEIR ASSESSMENT TO USERS OF A MEDICAL LIBRARY, PART I: AN OVERVIEW OF SERVICES, USERS, AND BUDGETING OF A MEDICAL LIBRARY

by

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July 1977

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PREFACE

This report covers the results of a study that began October 1, 1974 and ended March 31, 1977; originally scheduled for completion in two years, various problems extended the study period to 30 months. Viewed in terms of the goals established in the proposal, the study has succeeded. Indeed, to the extent that an operational cost assessment model is now being used as an adjunct to administrative decision making at the principal study site, the study can be judged to have had significant impact that will probably spread to other similar institutions.

The study team was co-directed by Abraham Charnes, Director of the Center for Cybernetic Studies (CCS) and University of Texas System Professor and Jesse H. Jones Professor of Biomathematics and Management Science, and Sam W. Hitt, former Executive Director of the Houston Academy of Medicine-Texas Medical Center (HAM-TMC) Library. Other members of the study team were:

1) Milton E. F. Schoeman (Senior Investigator), Associate Professor of Management at the Graduate School of Business, University of Texas at Austin.

2) Richard A. Lyders (Administrative Associate), current Executive Director of the HAM-TMC Library.

3) Diane Cole Eckels (Research Associate), Associate Director of the HAM-TMC Library.

4) Keith Russell (Project Coordinator), former Research Librarian at the HAM-TMC Library.

5) Edward S. Bres, III (Research Assistant), Ph.D. candidate at the Graduate School of Business, University of Texas at Austin.

6) John J. Rousseau (Research Assistant), Ph.D. candidate at the Graduate School of Business, University of Texas at Austin.

7) Donna Robinson (Clerical Assistant), former staff member at the HAM-TMC Library.

As can be seen from the composition of this team, the study was structured as a joint venture, using a team approach in pursuing the goals. The HAM-TMC Library was the "site" for information, data gathering, testing and implementing the results, while the University of Texas Center for Cybernetic Studies was the site for analytical and computational methods of development. Much of the detailed description of this arrangement and other information regarding the format and pursuit of this study can be found either in the formal proposal or the previously distributed "Progress Report: October 1, 1974-September 30, 1975."

This final report is divided into four parts, each describing a separate study issue:

Part I- "An Overview of Services, Users and Budgeting in a Medical Library" discusses the general administrative concerns prompting this study initially. Briefly stated these concerns can be summarized in the question "how can the cost of a library be equitably allocated to its supporters in justifying its budget?"

Part II- "Recovering Costs from Service Usage" describes a model for associating one portion of total library costs with usage; the model's output are a set of

charges that can be used to recover (justify) these usage-based costs.

Part III- "Allocating Fixed Joint Costs" describes a model for completing the cost assessment (justification) process by accounting for the fixed joint costs; a "fair" and equitable mechanism is developed in the context of a game-theoretic approach.

Part IV- "Differences in the Use of a Health Science Library by Various Users" is a summary analysis of sample and survey data collected to facilitate the structuring of the cost assessment models. The results correlate well with previously discussed observations and extend some of them into new directions.

Although some references are made to other parts in the report, each part is written as a reasonably self-contained unit. Thus, readers may selectively choose to focus on only those topics of immediate interest and not need to read the entire report.

It should be explicitly noted that the data and relations ascribed to the HAM-TMC Library are real. The output assessments provided in one part have actually been used in the most recent budgeting cycle. Further refinements in the model are necessary, but the current version is already providing the library administration with a unique and practical tool for developing and analyzing its budget. It is anticipated that similar successful application can be made in other libraries once information in this report is

circulated.

Finally, the assistance of many staff members and professionals, both at the University of Texas and the HAM-TMC Library, is gratefully, albeit anonymously, acknowledgeed. Without the support and wholehearted cooperation of the National Library of Medicine and its project monitoring staff this study could not have been undertaken and carried through. The study team accepts full responsibility for the contents of this report and any criticisms should be directed to them.

CCS, Austin; HAM-TMC Library, Houston

July, 1977

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PART I

AN OVERVIEW OF SERVICES, USERS AND BUDGETING OF A MEDICAL LIBRARY

I-1. Introduction

Any library, specifically a medical library, provides a wide variety of services directly to its users. These direct services may, in some instances, interrelate with one another, so that the use of one affects the use of another. More importantly, there are many so-called support services which are necessary to the overall operation of the library. The need for these support services extends to most, if not all, of the direct services. In some instances a direct service may not even be available without the proper level of various support functions.

Together these direct services and support services give rise to the costs that must be recovered somehow in maintaining the operation of the library. While constructing the library's budget may be a straightforward matter of adding together all proposed resource expenditures for the year, relating these costs, or more appropriately allocating these costs, to the services generating them is a very difficult administrative problem. Not only do the direct services interrelate and the support services get shared, but different users may create different demands even on the same service yielding higher or lower costs. The library's administration must deal with these issues either in justifying its budget or in monitoring its performance.

The focus of this study is precisely this cost analysis and its use in budgeting. The source of information is the Houston Academy of Medicine - Texas Medical Center Library. According to Medical Library Statistics for 1975/76, compiled by Donald D. Hendricks of the University of Texas Health Science Center at Dallas, the Houston Academy of Medicine - Texas Medical Center Library ranks second in total library expenditures of 107 medical libraries surveyed in the United States and Canada, with expenditures of $1,263,612. This is in contrast to expenditures in 1971/72 of $429,315, the year following the adoption of the 5th Operating Agreement which saw the beginnings of the formal financial support given the Library by 12 participating institutions. This threefold increase in expenditures in just four years made the need for a fair allocation of the budget to the participating institutions imperative.

I-2. Background

The HAM-TMC Library serves as the central library for a large medical complex, the Texas Medical Center, in Houston, Texas (see Figure I-1). The library may be likened to the main library on a university campus, where a broad range of programs operate. As on most university campuses, where there are smaller collections serving specific programs, such as engineering, architecture, etc., in the Medical Center this relation holds true as well; although in this case there is a complete administrative separation among the libraries. There is the cancer collection of the University of Texas M.D. Anderson Hospital and Tumor Institute; the collection of public health materials at the University of Texas School of Public Health; the University of

Texas Medical Center

- **MAJOR INSTITUTIONS & BUILDINGS**
  1. Anderson Mayfair
  2. Baylor College of Medicine
  3. Baylor Primate Center
  4. Ben Taub General Hospital
  5. Central Heating and Cooling Facility
  6. City of Houston Public Health Department
  7. Laurence H. Favrot Hall
  8. Fondren and Brown Orthopedic and Cardiovascular Research Center
  9. Hermann Hospital
  10. Houston Speech and Hearing Center
  11. Institute of Religion and Human Development
  12. Jesse H. Jones Library Building
  13. March Culmore Residence Hall
  14. The Methodist Hospital
  15. St. Luke's Episcopal Hospital
  16. Shriner's Hospital for Crippled Children
  17. Texas Children's Hospital
  18. Texas Institute for Rehabilitation and Research
  19. Texas Medical Center Child Care Center
  20. Texas Medical Center Grounds Division
  21. T.M.C. Hospital Laundry Cooperative Association
  22. Baylor College of Medicine–Houston Independent School District High School For Health Professions
  23. Texas Research Institute of Mental Sciences
  24. Texas Women's University
  25. The University of Texas Dental Branch
  26. The University of Texas M. D. Anderson Hospital and Tumor Institute
  27. The University of Texas Medical School
  28. The Univ. of Tex.Graduate School of Biomedical Science
  29. The U.T. School of Public Health
  30. Neurosensory Center
  31. Institute of Hemotherapy

- **MAJOR ENTRANCES**
  - ① Fannin Street and Ross Sterling Ave.
  - ③ Fannin Street and M. D. Anderson Blvd.
  - ④ Fannin Street and Bates Street.
  - ⑤ Holcombe Boulevard and Bertner Ave. (North)
  - ⑥ Holcombe Boulevard and John Freeman Ave.
  - ⑦ Holcombe Boulevard and Bertner Ave. (South)
  - ⑧ Braeswood Boulevard and Bertner Ave.

- **PARKING GARAGES**
  - No 1 Enter from Fannin Street.
  - No 2 Enter from Holcombe Blvd. or Bates Street.
  - No 3 Enter from East Cullen St.
  - No 4 Enter from Outer Belt Drive or Ross Sterling Ave.
  - No 5 Enter via Bates St. near John Freeman Ave.

Figure I-1.

Texas Dental Branch Library; and other smaller current collections. But the larger, central collection for the Texas Medical Center is in the HAM-TMC Library and all programs rely on its collections and services to one extent or another.

The Library's user population of students and full-time faculty in the supporting Medical Center institutions and the practicing physicians of Harris County who support the Library through the Houston Academy of Medicine, numbers about 10,000. The institutions that make up this user population, which support the HAM-TMC Library, are as follows:

Baylor College of Medicine

Houston Academy of Medicine

Texas Woman's University

Texas Medical Center, Inc.

University of Texas Health Science Center in Houston

University of Texas M.D. Anderson Hospital and Tumor Institute

Prairie View A&M University School of Nursing

Texas Institute for Rehabilitation and Research

Texas Research Institute of Mental Sciences

Institute of Religion

Harris County Hospital District

Hermann Hospital

The Methodist Hospital

St. Luke's Episcopal/Texas Children's Hospital

Memorial Hospital System

St. Joseph Hospital

Veterans Administration Hospital

The personnel or programs of these institutions, which define the kinds of collections and services required of the Library, are as follows:

Medical students and faculty

Nursing students and faculty

Dental students and faculty

Allied health students and faculty

Interns and residents

Graduate programs

- Biomedicine
- Nursing
- Dentistry
- Public Health
- Occupational therapy
- Physical therapy

Postgraduate programs

- Religion and ethics
- Psychiatry
- Dentistry
- Medicine

Practicing physicians continuing education

I-3. Direct Services

The HAM-TMC Library provides a full range of information services to its user groups which we refer to as direct services in contrast

with the Library's support services, such as administration, acquisitions, and cataloging. Among the direct services provided are:

a. Provision of the information bank (browsing, etc.)

b. Use of materials in the building

c. Study space for use of one's own materials

d. Circulation of materials for use outside the building

e. Photocopy by the Library (requested by phone or in person)

f. Telephone "paging" service

g. Interlibrary lending (to other TMC libraries)

h. Interlibrary lending (Regional Medical Library Program)

i. Delivery and pick-up service

j. Interlibrary borrowing

k. "Rush" processing, on-demand

l. "Notify" service on receipt

m. Reserve collections

n. Reference (informational)

o. Reference under ten minutes

p. Reference over ten minutes

q. Manual bibliographies

r. File Maintenance

s. Computer searches, MEDLINE, SDILINE, SDC services, etc.

t. User education

(1) class lectures

(2) orientations

(3) MEDLINE demonstrations

u. Public relations and communications (outreach programs and library committees)

v. Telephone "holds"

w. Self service photocopy

Each of these direct services requires varying amounts and types of resources in terms of labor and equipment. Supplies can be considered as relatively inconsequential, with the exception of some larger items such as photocopy paper and computer terminal paper. A matrix showing types of resources required by each direct service has been developed and is shown in Table I-1.

Clearly, some services require primarily student labor whereas other services require professional labor. Table I-2 then shows a grouping of direct services into three labor distinguishable categories: self-service, mediated, and in-depth. The activities within each category require varying amounts of time from different levels of personnel.

Some of the direct services as shown in Table I-1 are not listed in Table I-2. This was done fairly arbitrarily; it was a matter of convenience and administrative priority that attention was focused on those shown in Table I-2. Costs of direct services distinguishable in such a hierarchy may be more readily estimated and associated with use. Usage, in turn, is the natural basis for accounting for direct services. Thus, the budget for direct services can be constructed from usage.

Historically, the HAM-TMC Library's assessment model for recovering its budget from participating institutions has contained a use

Table I-1

Direct Services/Resources

Direct Services	Public Service Manpower							Machines			
	Professional	Clerk 4 (Highest)	Clerk 3	Clerk 2	Clerk 1 (lowest)	Student Assistant		Photocopy Machines	TWX	MEDLINE Terminal	Circulation Terminal
1. Information bank											
2. Use of materials in bldg.						X					
3. Study space											
4. Circulation	X	X	X		X	X					X
5. Photocopy bo the library				X		X		X			
6. "Paging"		X				X					
7. Interlibrary lending (within TMC)	X			X	X	X		X	X		
8. Interlibrary lending (RMLP)	X			X	X	X		X	X		
9. Delivery and pick-up						X					
10. Interlibrary borrowing	X		X	X					X		
11. "Rush" processing		X									
12. "Notify" service		X									
13. Reserve collections		X	X			X					X
14. Reference (informational)	X										
15. Reference under 10 minutes	X										
16. Reference over 10 minutes	X										
17. Manual Bibliographies	X			X							
18. File Maintenance	X			X							
19. Computer Searches	X									X	
20. User Education	X										
21. Public relations	X										
22. Telephone "holds"		X									
23. Self-service photocopy						X		X			

Table I-2

Hierarchy of Direct Services

SERVICE	LABOR REQUIRED
Self-Service	
1. use of materials in building 2. study space own materials 3. self-service photocopy	student assistant labor
Mediated	
1. circulation 2. photocopy on demand 3. interlibrary lending 4. reserve 5. reference (under 10 minutes) 6. interlibrary borrowing	professional, clerical, student assistants for short lengths of time
In-Depth	
1. computer searches 2. manual bibliographies 3. reference (over 10 minutes)	professional labor for longer lengths of time

factor derived by considering the costs of five direct services. These five services are:

(1) Circulation

(2) Information Services (all reference questions)

(3) Computer searches

(4) Interlibrary borrowing

(5) Interlibrary lending (net among the TMC Libraries)

The Library has been gathering statistics on these five services for several years, and adding more services to the model would require additional statistical gathering procedures. As a start, breaking reference questions into two categories was simple enough; adding manual bibliographies could readily be accommodated; and a study was undertaken to determine a relationship between circulations and use in the Library. The new model allows for additional use categories and, as statistical gathering procedures are set up, further direct services can be incorporated into the use factor.

I-4. Support Services

To give the complete picture of a library, support services must be considered along with direct services to the users, just covered. In terms of cost to operate a library, these support services correspond in general with the library's fixed costs. And, conversely, the direct services correspond with variable costs. Table I-3 lists the support services isolated for the HAM-TMC Library and by extension those for all medical libraries.

And these support services require varying amounts and types of resources as is shown in Table I-4.

Table I-3

Support Services

(1) Selection of books and journals

(2) Ordering and receipt of books and serials

(3) Cataloging, classification, and processing

(4) "Weeding" the collections

(5) Obtaining replacements for lost material

(6) Binding and mending of material

(7) Security of the collections

(8) Shelf reading

(9) Storage of materials

(10) Provision of the physical facility

(11) Maintenance of uncataloged files of pamphlets

(12) Administration

Table I-4

Support Services/Resources

	Administration	Professional	Clerk 4	Clerk 3	Clerk 2	Clerk 1	Student Assistant	Money for Materials and Services
Administration	X		X	X		X		
Collection purchase		X		X				122K
Physical facilities	X		X	X				
Storage								
Shelf reading							X	
Security			X	X				
Binding Mending					X			13K
Replacement		X			X	X		4K
Weeding		X	X	X		X		
Cat/class		X		X	X	X		
Ordering Receipt		X	X			X		
Selection		X						

I-5. Relationship between Direct Services and Support Services

In all libraries direct services depend upon support services. Support activities are required for the library to offer any services. Some support services impinge upon all other services--the library building for example (see Table I-5). There would be no services as we customarily think of them without the library building. On the other hand, some support services relate to only certain direct services. These relationships, as they prevail in the HAM-TMC Library, are shown in Table I-5.

It is apparent from Table I-5 that some direct services are more directly related to support services than others, and conceivably support costs could be allocated on that basis. However, support activities are required for a library to offer any services. For example, interlibrary borrowing does not directly rely on many aspects of support, but the service could not be offered outside of a library.

Thus, a large portion of the total operating budget is not easily attributable to a particular service. The "joint costs" which are essential for the library to exist we call support costs. An example of a "support cost" may be found in the book collection. A book may be used for in-house use, reference, circulation, or many other services. Therefore it is impossible to apportion the cost of the book collection to the direct services on any basis that is not in a sense arbitrary. There are some convenient mechanisms for allocating these costs in cost accounting, but these allocations do not reflect how the costs are actually incurred.

Table I-5

Relationship of Direct Services and Support Services

Direct Services	Selection	Ordering and Receipt	Cataloguing/Class	Weeding	Replacement	Binding & Mending	Shelf reading	Storage	Physical facilities	Collection/Purchase	Administration	Security (Tattle-tape)
Information bank	X	X	X	X	X	X	X	X	X	X	X	X
Use of material bldg.	X	X	X	X	X	X	X	X	X	X	X	X
Study space									X		X	
Circulation	X	X	X		X	X	X	X	X	X	X	X
Photocopy on demand	X	X	X		X	X	X	X	X	X	X	X
"Paging"									X			
Interlib.lending-TMC	X	X	X		X	X	X	X	X	X	X	X
Interlib.loan non TMC	X	X	X		X	X	X	X	X	X	X	X
Delivery & pickup									X			
Interlib. borrowing									X			
"Rush" processing	X	X	X						X	X		
"Notify" service		X	X						X	X		
Reserve	X	X	X		X	X	X	X	X	X	X	X
Reference (info.)									X			
Reference < 10 min.	X	X	X		X	X	X	X	X	X	X	X
Reference > 10 min.	X	X	X		X	X	X	X	X	X	X	X
Manual biblio.	X	X	X		X	X	X	X	X	X	X	X
File maintenance		X		X	X		X	X	X	X	X	X
Computer searches									X		X	
User education									X		X	
Public relations									X		X	
Telephone holds									X			
Self-serv.photocopy									X			

A large portion of these support costs are related to input, such as the cost of purchasing and cataloging books and journals. Some of the support costs are relatively fixed regardless of the quantity of usage. For example, the technical services personnel and materials costs are dependent upon the number and types of publications purchased and policies of processing. Therefore these costs are related to the programs of the institutions using the library rather than actual use of the collection. For example, regardless of the amount of use made of a library, a medical school requires a different type of library than a hospital does.

The remainder of the costs for support activities are variable with the amount of usage of the services; for example, duplicate or additional materials are required to accommodate more users or additional administration may be required to manage additional personnel hired because of more usage. Thus, the budget for recovering support costs seems to be divided between one portion recoverable through a use factor and another portion recoverable through an institutional or program-related fixed fee.

In the case of the HAM-TMC Library, for example, a participating institution would pay an assessment composed of a portion which is based on the amount and type of use its individual members make of the library and a portion based on the costs of the library they would expect to have available when they wish to use it, modified by the amount they have saved by not developing their own individual collection and providing a suitable building.

I-6. Summary

All libraries provide direct services to users which, in turn, require support services. The total operating costs of a library may be described as: Total Costs = Out-of-Pocket Costs for direct services + Support Costs variable with usage + Support Costs fixed with usage but related to institutional programs and other factors. A reasonable and equitable approach to budgeting for these costs is to incorporate a usage-based factor and a program-based factor. The first would account for the out-of-pocket costs for direct services plus variable support costs, while the second would account for the fixed support costs.

For the HAM-TMC Library an assessment model utilizing this approach was generated. Data on both institutions and their individual members were used to construct the usage relationships. Accepted standards for institutional libraries were used in developing relative contribution bases for fixed costs. The model allows the Library's administration to discuss and refine institutional assessments rapidly and accurately as priorities change or unforeseen circumstances arise. The consistent logic and equitable basis for charges provides a rational means for comparing and contrasting assessments. It should provide the participating institutions with a greater measure of understanding and acceptance. The remaining parts of this report discuss this assessment model and its application.